

REMARKS

No new matter is believed to be added to the application by this amendment.

Entry of Reply

Entry of this Reply under 37 C.F.R. §1.116 is respectfully requested because it places the application into allowance. Alternatively, entry of this Reply is respectfully requested because it places the application in better form for appeal.

Status of the Claims

Claims 1-12 are pending in the application and stand rejected.

Rejection Under 35 USC §112, First Paragraph

Claims 3-5, 9-11 are rejected under 35 USC §112, first paragraph as not being enabled. Applicant traverses.

Claim 3 of the invention sets forth that "the electrode line has first and second metal layers of a dual-layered structure, and a side portion of the first metal layer is more etched than a side portion of second metal layer." Claim 4 in the invention states that "the first metal layer is made of one of aluminum, an aluminum alloy, AlNd, copper or a copper alloy." Claim 5 of the invention sets forth that "the second metal layer is made of one of Cr, Cr-

alloy, Mo, Mo-alloy, Ta, Ta-alloy, W, or W-alloy." These claims are fully supported at page 5, lines 12-16 of the specification.

At pages 2 and 3 of the Office Action, the Examiner discusses related art having materials appearing to be more etched than aluminum. However, the materials of the first and second metal layers of claims 4 and 5 (and claims 10 and 11) pertain to two groups of materials that are to be selected so that the first metal layer is more etched than that of the second metal layer. That is, a person having an ordinary skill would choose the appropriate materials from each group in order to achieve this effect. As a result, the claims of the invention are fully enabled.

Accordingly, this rejection is overcome and withdrawal thereof is respectfully requested.

Rejection Under 35 USC §102(e) Hong

Claims 1, 4, 5, 7, 10, and 11 are rejected under 35 USC §102(e) as being anticipated by Hong (USP 6,172,733 B1). Applicant traverses.

The Present Invention and its Advantages

The present invention pertains to an array substrate for a liquid crystal display device which includes an electrode line

formed on a substrate, an organic insulating layer formed on an exposed surface of the substrate well covering the electrode line, and the electrode line has an over hang or a taper angle of a side portion of the electrode line that is more than 45° from a top surface of the electrode line.

The inventive array substrate is formed using technology that yields a product having clear advantages over the related art.

First, the inventive overhang structure is formed when the array including a first metal layer of aluminum (Al) and a second metal layer of chromium (Cr) is wet-etched by using a spray mode or a shower mode. A mixed acid is used as an etchant, which includes H_3PO_4 (65 Wt%), HNO_3 (5 Wt%), CH_3COOH (10 Wt%) and DI water.

Second, during early etching, the upper molybdenum (Mo) only etches and is then over-etched beyond the edge of the electrode line. Then, etch of the exposed lower Al also starts, and the Al etches such that its edge parts become substantially equal to the upper layer (Mo) beyond the edge of the electrode line.

Third, if the etching continues under the condition that the edges of the upper and lower layers are substantially the same, Al (Oxidation Electro-Potential: 1.66), which is more easily oxidized due to its Metal Standard Oxidation Electro-Potential, becomes etched deeper than Mo (Oxidation Electro-Potential: 0.2) because of

the electrode reaction, whereby the structure shown in FIG. 4B is formed.

Therefore, if the second and third processes are performed using the etchant and the processing mentioned first, Al can be over-etched as compared with Mo, and thus the problems indicated by the Examiner, that is, an Al material layer is more etched than a Mo material layer, may be solved.

Distinctions of the Invention Over Hong

At page 4 of the Office Action, the Examiner asserts that Figure 5d and Figure 5e of Hong depicts an end portion of the electrode line that has a taper angle of more than 45° from a top surface of the electrode line. However, there is no disclosure or suggestion of a 45° angle in Hong. The Examiner is apparently alleging that Hong discloses this taper angle by "eyeballing" Figures 5d and 5e. When the reference does not disclose that the drawings are to scale and is silent as to dimensions, arguments based on measurement of the drawing features are of little value. See Hockerson-Halberstadt, Inc. v. Avia Group, Int'l 222 F.3d 951, 956, 55 USPQ2d 1487, 1491 (Fed. Cir. 2000). See also MPEP 2125. In this case, Hong fails to disclose that the drawings are to scale and are silent as to dimensions. As a result, arguments based on

measurements of the drawing features in Figures 5(d) and 5(e) have no value.

Hong additionally fails to disclose an electrode line having two metal layers where a side portion of the first metal layer is more etched than a side portion of the second metal layer, as has been admitted by the Examiner. Further, as discussed above, Hong fails to teach or suggest any technology that can obtain this electrode configuration. As a result, the Examiner's rejections of claims 4, 5, 10, and 11 as being anticipated by Hong additionally fails because these claims incorporate the two metal layer embodiments by their dependencies.

Hong, as a result, clearly fails to anticipate the invention. This rejection is accordingly overcome and withdrawal thereof is respectfully requested.

Rejections Based On Kakuda

Claims 1-5 and 7-11 are rejected under 35 USC §103(a) as being obvious over Kakuda (USP 5,162,933) in view of Kim '452 (USP 6,188,452 B1). Claims 6 and 12 are rejected under 35 USC §103(a) as being unpatentable over Kakuda in view of Kim '452 and further in view of Kaneko (USP 6,404,473 B1). Applicant traverses.

Kakuda pertains to an active matrix structure for liquid crystal display elements. At page 5 of the Office Action, the Examiner asserts that Kakuda discloses an electrode line having first and second metal layers and an inorganic insulating layer. The Examiner turns to Figure 8 of Kakuda and asserts that this drawing shows an end portion of the electrode line that has a taper angle of more than 45° from a top surface of the electrode lines.

Similar to the Examiner's treatment of Hong, the Examiner appears to be "eyeballing" Figure 8 to allege that this reference teaches an angle of 45° . The impropriety of analyzing a drawing figure in this fashion has been discussed above. That is, Kakuda fails to set forth that the references are to scale and it is silent as to dimensions. As a result, arguments based on measurements of the drawing features are of little or no value. See MPEP 2125.

Kakuda accordingly fails to disclose or suggest an angle of 45° . The teachings of Kim '452 and Kaneko fail to address this deficiency of Kakuda.

Further, as discussed above, Kakuda, Kim '452 and Kaneko fail to teach or suggest any etch technology that can obtain the inventive electrode configuration such as is shown in Fig 4B of the application and claimed in independent claims 1 and 7.

As a result, a person having ordinary skill in the art would not be motivated by the teachings of Kakuda and Kim '452 or Kakuda, Kim '452 and Kaneko to produce the invention as is set forth independent claims 1 and 7 and their dependent claims. A *prima facie* case of obviousness has thus not been made over Kakuda and the secondary references.

These rejections are accordingly overcome and withdrawal thereof is respectfully requested.

Rejections Based Upon Kim '783

Claims 1-5 and 7-11 are rejected under 35 USC §103(a) as being obvious over Kim '783 (USP 6,048,783) in view of Kim '452 (USP 6,188,452 B1). The Examiner adds the teachings of Kaneko to reject claims 6 and 12.

Kim '783 pertains to a method of forming an electrode on a substrate of a semiconductor device. At page 7 of the Office Action, the Examiner asserts that Kim '783 teaches a method of forming an array substrate that includes forming an electrode line having a first and second metal layer and forming an insulating layer on an exposed surface of the substrate. The Examiner then asserts that Kim '783 contains Figures 8 and 10 shows the tape angle of more than 45° from the top surface of the electrode lines.

Applicant respectfully notes that Kim '783 does not contain Figure 8 or Figure 10 on which the Examiner bases his purported analyses. Figure 3(b) and 3(c) of Kim '783 however, do depict tapered structures to which the Examiner may have been referring.

However (similar to Hong and Kakuda), Kim '783 fails to disclose that the drawings are to scale and is silent as to dimensions. As a result, arguments based on measurements of the drawing features are of little or no value. See MPEP 2125.

Kim '783 accordingly fails to teach or suggest the taper angle of more than 45°. The teachings of Kim '452 and Kaneko fail to address this deficiency of Kim '783.

Further, as discussed above, Kim '783, and Kim '452 and Kaneko fail to teach or suggest any etch technology that can obtain the inventive electrode configuration such as is shown in Fig 4B of the application and claimed in independent claims 1 and 7 and their dependent claims.

As a result, a person having ordinary skill in the art would not be motivated by the teaching of Kim '783, Kim '452, and Kaneko to produce a claimed embodiment of the invention. A *prima facie* case of obviousness has thus not been made.

This rejection is accordingly overcome and withdrawal thereof is respectfully requested.

Foreign Priority

The Examiner has acknowledged foreign priority in the Office Action mailed August 22, 2002.

Prior Art

The prior art cited but not utilized by the Examiner shows the status of the conventional art that the invention supercedes. Additional remarks are accordingly not necessary.

Conclusion

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Robert E. Goozner, Ph.D (Reg. No. 42,593) at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

Pursuant to 37 C.F.R. §§ 1.17 and 1.136(a), Applicant(s) respectfully petition(s) for a three (3) month extension of time for filing a reply in connection with the present application, and the required fee of \$950.00 is attached to the concurrently filed Notice of Appeal.

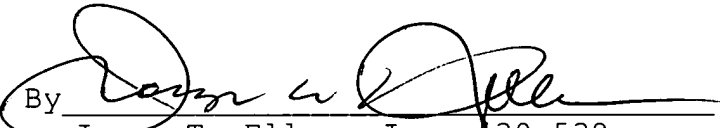
Reply of December 4, 2003
Response to Office Action of June 4, 2003


Appl. No. 09/742,473

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By 
James T. Eller, Jr., #39,538


JTE/REG/jls
3430-0161P

P.O. Box 747
Falls Church, VA 22040-0747
(703) 205-8000

Attachment(s)